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VARIETIES OF HARD SPRING WHEAT.

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INTRODUCTION.

This paper deals with the varieties of hard spring wheat, both common and durum. What they are, how and when they came to be, and how to tell them apart are stated clearly. The particular sections and districts to which they are suited are shown.

Very few popular descriptions of wheat varieties have been available in the past. Consequently, farmers have had little chance to become acquainted with the differences between varieties.

Farmers have been urged to keep their varieties pure. In order to do this they must be able to know what a variety really looks like.

They have been advised to grow only one variety in a community. But not always were they told what variety was best and why.

It is not always easy to recognize a variety from its description. Often two varieties really different look very much alike. Sometimes the visible difference is very small. Sometimes there is no visible difference at all, although there is a real difference in yielding power.

Unfavorable weather conditions often change the appearance of a variety very much. Droughts reduce the height, bleach the colors, and shrink the kernel. Wet weather may increase the height above the average and change the color of the spike and chaff. Attacks of rust and other diseases also cause changes in appearance.

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It is hoped that this bulletin may help the northern Plains farmer to know—

(1) The differences that exist between different groups of wheat.

(2) The real varieties that are found in each of these groups.

(3) What varieties or group of varieties are best suited for growing in his community.

The spring-wheat crop is important in the United States. Nearly one-third of our immense crop is spring wheat. Most of this third is grown in the northern Plains area, including Minnesota.

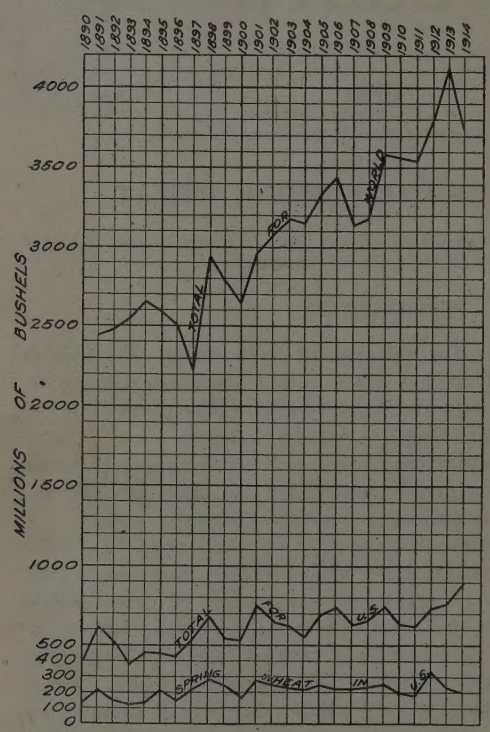

FIG. 1.—Diagram showing the millions of bushels of spring wheat grown in the United States, compared with the total wheat production in the United States and in the world, for the years 1890 to 1914, inclusive.

Figure 1 shows how much spring wheat has been grown in the United States each year for 25 years. It shows also, for comparison, how much wheat, winter and spring combined, is grown here, and how much the world grows.

Where we grow our spring wheat is shown later. (See figs. 6 and 7.)

MASS VARIETIES AND PURE LINES.

Much attention is being given nowadays to improved varieties of farm crops. It is very difficult to tell just what is meant by the word variety; in fact, it means different things to different people. In general, it means a collection of plants in which all the individuals are alike in appearance, including form, size, color, and other visible characters.

Within such a variety usually there are many strains which, though looking alike, have different abilities and, therefore, different values.

We know that two persons who look very much alike often have very different inclinations and abilities. So, too, with similar plants.

What makes the differences in the yielding ability of the different races found in any ordinary variety is not known. It has not been determined accurately in most cases. One may be more drought resistant, another more rust resistant, a third more cold resistant, a fourth simply a better yielder, and so on. An ordinary variety, probably composed of many such races, we call a mass variety.

Each single plant grows from a single seed. If the crop is self-fertilized, that is, if each flower is fertilized with its own pollen, each seed is pure and will produce a pure plant. Wheat normally is a self-fertilized crop. If seed from such a pure plant or from one of its heads is thrashed separately and sown, its descendants will be what is called a pure line. Other names for the same thing are pure strain, pure race, and pedigreed variety. A race founded thus on one pure plant remains a pure line just as long as it continues to be self-fertilized and is kept free from mixture with the seed of other races or varieties.

In open-fertilized crops, such as corn, rye, etc., where each flower usually is fertilized by pollen from another flower, and often from another plant, pure lines can be obtained only by separating single pure plants and compelling them to self-fertilize. This is done by covering the ears or heads with a paper sack or by growing the plant at a distance from other plants of its kind. Pure lines thus obtained can be kept pure only by the same means.

In any mass variety there may be several races. Some of these are likely to be good yielders and some to be poor yielders.

Plants belonging to different races often can not be told apart by outward appearance. In any field there will be many plants which belong to one race, whether the number of races be few or many. Hence, in finding the high-yielding races in the mixture, the breeder must choose a large number of plants in order to be sure he gets some of each race. He then grows their descendants separately until the experiments show how many races he has and which are the best.

These best ones are increased until the quantity of seed is sufficient and then, through various channels, they are carried out to the farms. Since they were selected for yielding power, it follows that any races worth keeping must be better yielders than the mixture of good and poor races from which they were taken.

The foregoing discussion of mass varieties and pure lines is given in order that the two kinds of varieties may be understood and the greater value of good, pure lines be recognized.

Most of the varieties discussed in this bulletin are mass varieties. Others are, or were, pure lines. Many of the mass varieties grown

in the spring-wheat section are mixed with other varieties. Some of the pure lines, too, have become mixed with other races or other varieties since they were first distributed. In most cases these mixtures are not serious enough to change varietal results.

COMMON WHEAT AND DURUM WHEAT.

The hard spring wheats of the northern section of the Great Plains area belong to two main divisions, or subspecies[1]—common wheat and durum wheat—which are very distinct from each other.

HOW TO TELL THEM APART.

The plants and heads of a durum wheat and of different groups of common wheat are shown in figures 2, 3, and 4.

The common wheats have beardless or short-bearded heads (fig. 3, *b*, *c*, and *d*). The spikelets (meshes or breasts) are so far apart that they hardly overlap at all (fig. 4, *A*2 and *A*3). In all the common wheats discussed in this paper the spikelets are pressed close to the stem of the head and stand nearly straight up (fig. 4, *B*2 and *B*3). The head, therefore, is flattened parallel to the face of the spikelet. The beards when present are only 2 to 3 inches long. The kernels are mostly red or white, those of all the varieties commonly grown in the northern Plains being red.

The durum wheats have rather stout heads. All of them have long beards, varying from 4 to 6 or 8 inches in length (figs. 2, *a;* 3, *e;* 4, *B*1). The spikelets are set close together and overlap much (figs. 3, *e;* 4, *B*1). They stand out from the stem at a wide angle. This makes the head wider when seen from the edge (fig. 4, *B*1) than when seen from its face view (fig. 4, *A*1). In other words, the head is flattened at right angles to the face of the spikelet. The kernels are very large and very hard, and nearly all are a clear amber in color, although in a few varieties the kernels are reddish amber.

There are many common wheats, however, in Asia and elsewhere which have large, hard, amber kernels much like those of durum wheat. The bearded common wheats with such kernels do not resemble durum wheats in the least in the appearance of the head.

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[1] The first division, or subspecies, is called common wheat, from the Latin name *vulgare*, which means common. The botanical name of this division is *Triticum sativum vulgare*. *Triticum* is the surname or generic name for all wheats, *sativum* the name of that large division, or species, that is used most commonly for human food. Finally *vulgare* is the subspecific name for the common wheats, to distinguish them from the poulard wheats and the durum wheats, respectively.

The second subspecies is called durum wheat on account of its very hard kernels. The Latin name is *Triticum sativum durum*, in which the word *durum* means hard.

The common and durum wheats of this bulletin may be separated readily by the following key. There are some common

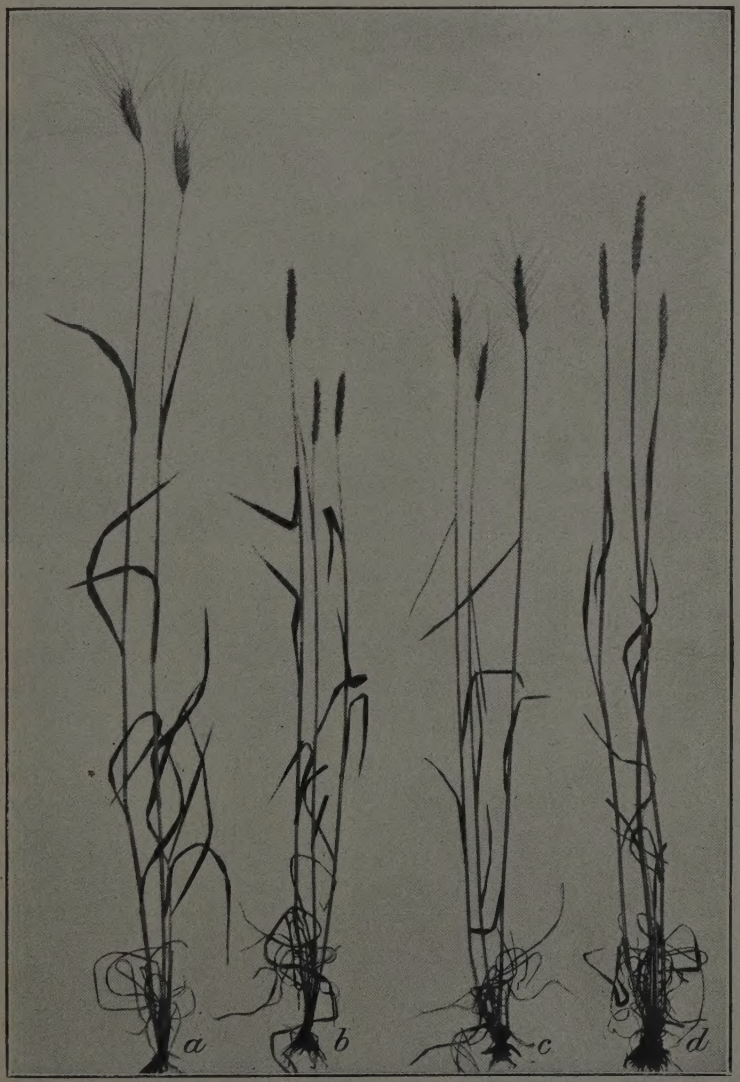

FIG. 2.—Plants of four hard spring wheats, representing durum wheat and three groups of common wheat; *a*, Kubanka (durum); *b*, Rysting (Fife); *c*, Preston; *d*, Haynes (bluestem).

wheats grown elsewhere in the United States which would not come under this description.

Heads rather slender, beardless or beards less than 3 inches long; spikelets far apart, scarcely overlapping, wide when seen in face view.....COMMON WHEAT.

Heads rather stout, all bearded, beards 4 to 8 inches long; spikelets close together, much overlapping, narrow when seen in face view.....DURUM WHEAT.

FIG. 3.—Heads of five groups of wheat: *a*, Turkey, a hard red winter wheat; *b*, Fife; *c*, Preston; *d*, bluestem; and *e*, durum wheat (edge view).

WHERE TO GROW THEM.

Every spring-wheat grower wants to know whether to grow common or durum wheat on his farm. A study of figure 5 will help to answer the question.

Figure 5 is a diagram showing wheat yields at 17 different experiment stations in the Great Plains area. These results were obtained partly by the State agricultural experiment stations, partly by the United States Department of Agriculture, and partly by the two in cooperation.[1]

[1] Most of the data on yields presented in figure 5 and discussed herein were obtained from cooperative experiments of the Office of Cereal Investigations. Those for Hays, Kans., and North Platte, Nebr., are from unpublished records of the Office of Dry-Land Agriculture, which kindly permits their use. Published results from the State experiment stations were used for the following places:

North Dakota, Edgeley.—O. A. Thompson, Annual Reports, Edgeley Experiment Substation, 1903 to 1913.

North Dakota, Fargo.—J. H. Shepperd and O. O. Churchill, "Cereal Crop Experiments," North Dakota Experiment Station Bulletin 75.

North Dakota, Langdon.—E. D. Stewart, Annual Reports, Langdon Experiment Substation, 1909, 1910, 1913.

Montana, Forsyth and Harlem.—Alfred Atkinson and J. B. Nelson, "Dry-Farming Investigations in Montana," Montana Experiment Station Bulletin 83.

For each station the figure shows a series of vertical columns, shaded in different ways. The number of columns in each case shows

FIG. 4.—Heads of durum and common wheat in two positions: *A*, Face view of spikelets; *B*, edge view of spikelets. 1, Kubanka (durum); 2, bluestem; 3, Preston.

the number of different groups of wheat grown in those years. Each column stands for the best variety of its group, and the height shows

the yield in bushels per acre, as explained in the legend. The groups are hard red winter (white), durum (black), Fife (light slanting lines), Preston (heavy slanting lines), and bluestem (dotted lines).

The yields shown are the average for the number of years specified in each case. These years vary at the different stations. The yields at Edgeley, N. Dak., are for 11 years, while those at Archer, Wyo., are for only 2 years. The others are for periods of 3 to 10 years.

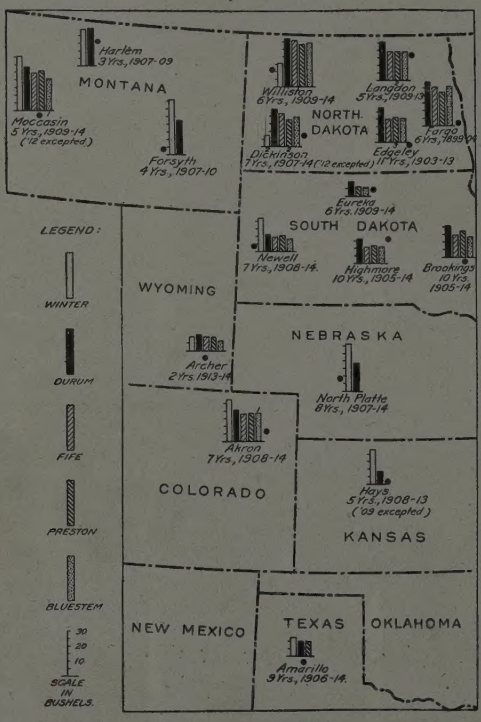

FIG. 5.—Diagram showing average yields, in certain periods of years, of the leading variety of the different groups of wheat at 17 stations in the Great Plains area. *1*, Average of only 3 years (bluestem at Moccasin and Akron); *2*, average of only 4 years (Preston at Langdon, winter and Preston at Dickinson); *3*, average of only 6 years (Preston at Edgeley).

The wheat yields of one station can not be compared fully with those of the other stations, because the years are different. Only at Brookings and at Highmore, S. Dak., are the years exactly the same and the yields really comparable.

At each station, however, the yields of all the different groups of wheat are nearly always for the same years. The yield of any one group, therefore, may be compared safely with the yield of the other groups at the same station, except where noted.

The study of figure 5 tells us some things very plainly. Here they are:

(1) Where winter wheat (the white column) can be grown safely it is a better yielder, and in many parts a much better yielder, than any spring wheat. The figure shows roughly where winter wheat can be grown. It does not tell all the story. For local details ask for fuller information.

(2) Durum wheat (the black column) has outyielded all other groups of spring wheat at all of the stations named.

We see that in the central parts of North Dakota and South Dakota the yields of durum wheat are 35 to 60 per cent higher than those of the best common wheat. Outward from this district the advantage of durum over common wheat is not so large.

In the eastern part of the Dakotas, where moisture is more abundant, its advantage is only 12 to 20 per cent over common wheat. Durum wheat was most largely grown in this eastern district in 1909 (fig. 7). Since then it has increased to the westward. Figure 5 shows that it should be greatly extended westward wherever spring wheat is better than winter wheat. Farther south it is the best spring wheat, but spring wheat is not nearly so good as winter wheat.

(3) Fife wheat (light slant-lined column) is the highest yielding common wheat in the northern and western part of North Dakota. It also is well adapted to eastern North Dakota and South Dakota and to Minnesota.

(4) The Preston group (heavy slant-lined column), as here shown, contains three different varieties. The only important one is the Preston. It gives good yields in central and eastern South Dakota, where it outyields all other groups of common spring wheat.

(5) Bluestem wheat (dotted column) is hardly equal to Fife except in eastern North Dakota. There and in Minnesota the bluestem wheats are well adapted and most largely grown.

COMMON WHEAT.

The hard red spring wheats are only one subdivision, or section, of the common wheat subspecies. Some of the other sections grown commonly in the United States are (1) the hard red winter wheats, (2) the soft red winter wheats, (3) the soft white wheats, etc. The acreage of all spring common wheat in the northwestern United States, most of it of the hard red varieties, is shown in figure 6.

The hard red spring wheats are here subdivided into three groups—Fife, bluestem, and Preston. These three groups may be separated easily by means of the following key:

Heads beardless:	
Chaff white, not hairy	1. FIFE.
Chaff white, hairy	2. BLUESTEM.
Heads bearded:	
Chaff white, not hairy	3. PRESTON.

There are a few varieties grown here and there in the northern plains which do not belong to any of these three groups. One of them, the Galgalos, is not a hard red wheat. They will be discussed under the heading "Miscellaneous varieties."

THE FIFE GROUP.

The wheats here called the Fife group are similar in appearance and most of them are closely related. The heads are beardless and

rather slender to medium stout (fig. 2, *b*). In general, they vary in length from 3 to 3½ or 4 inches. The Marquis, however, is somewhat shorter, usually about 3 inches. The chaff (glumes) of all varieties mentioned in this bulletin is white and without hairs (glabrous). The kernels are small to medium in size, red in color, and hard.

The following names have been used for wheats of the Fife group, at various times and places:

Assiniboine Fife, Bernard Fife, Bowman Fife, Canadian Fife, Fife, Ghirka Spring, Glasgow Fife, Glyndon Fife, Hauan, Herriman Fife, Marble, Marquis, McKendry Fife, McKissick Fife, Minnesota Fife, Minnesota No. 163, North Dakota No. 66, Percy, Pillsbury Fife, Power Fife, Red Fife, Rysting Fife, Saskatchewan Fife, Scotch Fife, Stanley, Verdon Fife, Wellman Fife, White Fife, and Wilcox Fife.

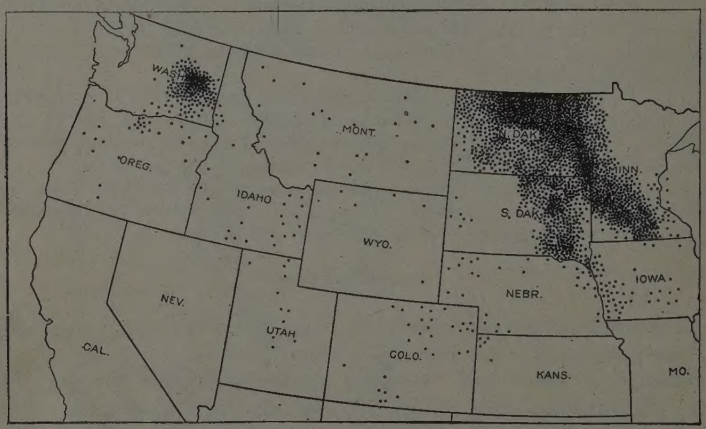

FIG. 6.—Outline map of the northwestern United States, showing where common spring wheat was grown in 1909. Note that nearly all of it is the hard spring wheat of the northern Great Plains area. Each dot represents 5,000 acres. (Figures from the Thirteenth U. S. Census, 1909.)

So far as known, 23 of these names, or all except Bowman, Ghirka, Marquis, Percy, Stanley, and White Fife, represent strains of the true Red Fife wheat.

RED FIFE.

The original Red Fife wheat is supposed to have come from Russia by way of Germany and Scotland. The story of its introduction to North America reads like a fairy tale. The record runs that about 70 years ago a Mr. David Fife, of Otonabee, Ontario, Canada, received from a friend in Glasgow, Scotland, a small sample of wheat. The friend had obtained the sample from a shipload of wheat from Germany, but supposedly of Russian origin.

Mr. Fife sowed the wheat in the spring, but it proved to be a winter wheat. However, a plant of spring wheat developed in the plat, and this was saved and increased. This wheat became known variously as Fife, Red Fife, Scotch Fife, and Canada Fife. From it are descended the strains of Fife wheat which make up so large a part of the hard spring wheat of America. These Fife wheats compose the bulk of the commercial grades "No. 1, Hard" and "No. 1, Northern," the standard spring wheats, and usually the highest priced wheats in the country.

Most of the 23 names listed as representing Red Fife wheat are merely local names. Many of them represent local stocks of seed that never became generally grown. To some extent, however, Glyndon (Minn. No. 163), Power, Rysting, and Wellman may be called definite strains of Red Fife. Each is discussed under its own name. Red Fife is grown under Cereal Investigations Nos. 3329 and 3694.

Although many lots of wheat have been imported from Russia in recent years, only once has a true Red Fife wheat been found among them. This lot (C. I. No. 2463) came from some part of Galicia, in either eastern Germany or western Russia.

These Red Fife wheats are high yielders in northern and western North Dakota and good yielders over most of the hard spring-wheat section. Glyndon is most widely grown, being known as "Minnesota No. 163." Where they are suited there is little choice among them if the seed is pure and good.

Glyndon.—This widely grown strain of Red Fife dates at least from 1891, when it was first grown as No. 811 at the Glyndon farm in western Minnesota. In the burning of the Glyndon station buildings all record of its origin was lost. Without doubt, however, it was one of the many samples of Red Fife wheat obtained from Minnesota farmers in 1888 and 1889.

In 1892 a selection of this Glyndon 811 was made and given Minnesota station number 163. It has been grown and distributed by the Minnesota Agricultural Experiment Station for many years as "Minnesota No. 163," but has recently been named by them Glyndon Fife, a name which the United States Department of Agriculture had already adopted for that number. The Cereal Investigations numbers for Glyndon are 1575, 2873, and 4143.

Power.—This well-known stock is said to have been started about 1885 by Mr. James Holes, of Fargo, N. Dak., from a single plant of Red Fife wheat found growing in an oat field. Some of this seed was obtained by Mr. J. B. Power, of Power, N. Dak., who increased it and distributed it in large quantities; hence the name.

Seed from Mr. Power was called North Dakota No. 66 and Minnesota No. 66, respectively, by the experiment stations in those two

States. Later selections from Minnesota No. 66 were given Minnesota numbers 149 and 276. Their Cereal Investigations numbers are 1506, 1574, 2989, 3025, 3697, and 4150.

Rysting.—This strain of Red Fife was obtained by the North Dakota Agricultural Experiment Station about 1892 from Mr. Jens Rysting, of Buxton, N. Dak. Mr. Rysting had been selecting this wheat for several years previously and claimed that it was earlier than ordinary Red Fife. This seed was taken to the Minnesota Agricultural Experiment Station and given its number 171. An incross between two plants of Rysting was made by the Minnesota station and the progeny called No. 292. The Cereal Investigations numbers for Rysting are 3022 and 4148.

Wellman.—This strain was bred by Mr. D. L. Wellman, of Frazee, Minn., from a sample of Red Fife wheat obtained from the Saskatchewan Valley, in Canada, and was sold as Saskatchewan Fife and Wellman Fife. This strain became No. 50 of the North Dakota Agricultural Experiment Station and No. 165 of the Minnesota Agricultural Experiment Station. The Cereal Investigations numbers for Wellman are 1576 and 4144.

GHIRKA SPRING.

The Ghirka Spring variety (C. I. No. 1517) came from Grodno Province, in Russian Poland. It was obtained by the Department of Agriculture at the Paris Exposition in 1900. It is probable, however, that seed has been brought to this country many times by Russian immigrants. Thousands of acres of it are grown in western North Dakota each year under the name "Russian" wheat.

It is somewhat different from the Red Fife varieties. The head is a little more slender and distinctly more tapering toward the tip. The kernel is slightly longer and paler red and a little softer than even the bluestem wheats. Ghirka is inferior in quality of flour to both the Red Fife and Bluestem varieties.

Ghirka Spring is a high-yielding Fife wheat. It has outyielded all other Fife varieties at four out of nine stations at which it has been tested in the northern Plains. In drier years its advantage over other varieties is even more apparent than in favorable seasons. In more humid districts or in wetter seasons it does not do as well. It seems more liable to injury from rust than even the bluestem wheats. Many pure races of this variety have been separated and tested. Several have been found which yield flour of good quality, and these are being increased in quantity for more extensive tests. Until they are completed it is not recommended for planting.

MARQUIS.

The Marquis wheat (C. I. Nos. 3276, 3641, and 4156) is a selection from a hybrid produced by crossing a hard red wheat from Calcutta, India, and the well-known Red Fife. This cross was made by Dr. A. P. Saunders, of Ottawa, Canada, about 1892. The Marquis

was first grown as a pure line in 1904. It resembles the Red Fife. It is a little shorter than Red Fife and matures earlier. The heads are beardless, with white, hairless chaff. They are somewhat shorter and stouter than those of other Fife wheats. The kernels are hard, dark red, both shorter and plumper than those of Red Fife, and have a broader furrow.

The Marquis was developed especially for the prairie Provinces of Canada, namely, Manitoba, Saskatchewan, and Alberta. In the first two Provinces especially, Marquis has given very good results. It has outyielded Red Fife by 10 to 45 per cent. During the last two years it has been tested at eight stations in our hard spring-wheat States. Its earliness is an advantage, and it has shown itself a somewhat better yielder than Red Fife strains during these two seasons. Farmers who are now growing suitable varieties are advised not to drop them for the Marquis until the latter has proved its value in their localities. It probably rusts more readily than the true Fife wheats.

THE BLUESTEM GROUP.

The wheats of the bluestem group of the hard red spring wheats are all very similar in appearance. They also are very closely related in their origin. The bluestems of the South Atlantic and Eastern States and the Palouse Bluestem of the Pacific Northwest belong to very different groups of wheat. They should not be confused with these hard red spring bluestems.

The bluestems of this bulletin are said to have come from Russia with Russian immigrants to the United States, but this probably is not true. No varieties belonging to this group have been found among the numerous wheat introductions from Russia in recent years.

The bluestem wheats are of medium height and rather more vigorous in growth than the Fife wheats. The heads are beardless, with white hairy chaff, and are rather stouter than those of the Fifes. The kernels are hard, red, plump, and of medium size. The chaff is more loose and open than in the Fife wheats, and the kernels shatter out easily if the crop gets overripe.

The following names have been used at one time or another for the bluestem wheats:

American Bluestem, Bluestem, Bolton Bluestem, Crossbred Bluestem, Dakota Bluestem, Davis Bluestem, Haynes Bluestem, Haynes Minnesota Bluestem, Haynes Pedigreed Bluestem, Houston Bluestem, Improved Bluestem, Jackson Improved Bluestem, Marvel Bluestem, Minnesota No. 169, North Dakota No. 316, Okagagon Valley Velvet Chaff, Okanogan Bluestem, Okanogan Valley Velvet Chaff, Pedigreed Bluestem, Select Bluestem, Velvet Bluestem, Velvet Chaff.

The names Bluestem, Velvet Bluestem, and Velvet Chaff are used for the bluestem group in general. The other names have been applied to selections or local lots of bluestem wheat.

In the bluestem group there is only one variety in the real sense of the word. There are, however, certain small variations in the breeding and local origin of some of the strains. These show themselves in slight differences of earliness and yield. The strains which have become commercially important under separate names are Bolton, Dakota (Select Bluestem), and Haynes (Minnesota No. 169).

BLUESTEM.

The word bluestem is used commonly as a name for this whole group and is often used also as a name for the variety grown on any given farm. This is correct in most cases, since there are no really distinct varieties in this group. However, when one of the pure or pedigreed lines is being grown it is better to call it by its varietal name, as Dakota, Haynes, etc.

Bolton.—The Bolton bluestem wheat was obtained originally from Thomas Bolton, of Park River, N. Dak., by the North Dakota Agricultural Experiment Station. It was first grown at that station in 1893 under the number 146. A sample sent to the Minnesota Agricultural Experiment Station was given Minnesota number 146 also. It was recorded as being one of the best 8 out of over 200 samples of wheat collected by them before 1894. It is also found under North Dakota No. 780. Cereal Investigations Nos. 1573, 2023, and 4142 have been given it. So far as known these are all mass varieties.

Dakota.—This pure line (C. I. No. 3083) originated at the North Dakota Agricultural Experiment Station about 1898. It was selected from the original Haynes, which probably was not a pure line. It was first called by its number, North Dakota No. 316, but later was called Select Bluestem. "Select" is not really a name. Besides, there are several other bluestem selections which have been called Select Bluestem.

For these reasons we prefer to name it Dakota here and hope that this name will be used. It seems proper to show in this way some recognition of the North Dakota Agricultural Experiment Station in its work with wheat. This race has been grown and distributed very extensively by that station, and probably is now the most widely grown race of bluestem wheat in that State.

Haynes.—This well-known variety originated with Mr. L. H. Haynes, of Fargo, N. Dak., about 1884. He started with an ordinary lot of bluestem wheat, and during 8 or 10 years selected it for good plants, good heads, and good kernels. It is not known whether the seed he distributed was a pure line or a mixture of several good pure lines which he had selected.

Haynes's selection was earlier than ordinary bluestem, and also had longer heads and larger kernels. It was obtained by the North Dakota Agricultural Experiment Station in 1891 and given the number 51. It was given later the same number 51 by the Minnesota

Agricultural Experiment Station. Other Minnesota numbers for this variety are 161, 169, 283, 294, and 479. One well-known pure line has been widely distributed by the latter station as "Minnesota No. 169." This is also called Haynes Pedigreed Bluestem.

The Cereal Investigations numbers 1505, 1577, 2874, 3020, and 3021 have been given to different lots.

THE PRESTON GROUP.

The Preston group is made up of common bearded wheats with white, hairless chaff. The kernels are red, of medium size and plumpness, and are hard or fairly hard. They differ from the Fife wheats most noticeably in being bearded.

This group of wheats has often been called Bearded Fife, Bearded Red Fife, and Velvet Chaff. The name "Velvet Chaff" is especially misleading, because these wheats have a hairless chaff. Also, the hairy-chaffed bluestem wheats are often called Velvet Chaff in Canada and parts of North Dakota. The name Bearded Fife is not used here, because they really are not Fife wheats, and Preston is preferable, because most of the bearded spring wheat grown is the Preston variety.

The following are names that have been used for the bearded spring common wheats of the Preston group:

Bearded Fife, Bearded Red Fife, Climax, Early Java, Erivan, Fretes, Golden Fife, Java, Johnson Early Fife, Johnson Fife, Minnesota No. 188, Preston, Pringle Champion, Pringle Champlain, Red Fife, Red Russian, South Dakota Climax, South Dakota No. 67, Spring Turkey, and Velvet Chaff.

All but six of the twenty names are only other names for the true Preston variety, so far as can be learned.

Erivan, Fretes, and the so-called Red Russian and Spring Turkey all belong to the Preston group, but are distinct varieties from the Preston variety. The Pringle Champion is probably a misspelled form of Pringle Champlain, a variety found only rarely in the hard spring-wheat section.

Preston.—The Preston variety was bred from a cross between Ladoga, a Siberian wheat, and the well-known Red Fife. The hybrid was made by Dr. A. P. Saunders, of Ottawa, Canada, in 1888. It is a bearded spring common wheat with hairless white chaff and midsized red and fairly hard kernels. It can be told from other members of the Preston group by the very short beaks on the outer chaff. These beaks are only one-sixteenth to three-sixteenths of an inch long.

Preston has been grown at Indian Head, Saskatchewan, since 1893. It was first grown by the Minnesota Agricultural Experiment Station in 1895 as Minnesota No. 188. It was widely distributed under this number instead of under the name Preston. Very soon the seed appeared for sale at different places under various new names.

After several years of this practice it scarcely could be found under its real name. On the boards of trade of Minneapolis and Chicago it was known as "Velvet Chaff." On the farms it was called Early Java, South Dakota Climax, Bearded Fife, Red Fife, Minnesota No. 188, and Velvet Chaff.

Under one or another of these names Preston has given good yields in central and eastern South Dakota and is rather widely grown there. It is found commonly also in eastern North Dakota and in parts of Minnesota.

Different lots of seed or different selections of Preston wheat from different sources have been given Cereal Investigations numbers. Among these are 2083, 2958 (Minnesota No. 188), 3081 (South Dakota No. 67), 3085, 3086, 3087 (these three are selections from 3081), 3318, 3328, 3691 (North Dakota No. 2366), 3692 (North Dakota No. 2393), 3698, 4153 (Minnesota No. 1011), and 4287.

Erivan.—The Erivan variety (C. I. No. 2397) was brought from the dry mountain district of the Erivan Government, in Transcaucasian Russia, near the border of Persia. It is bearded, with white, hairless glumes and red, medium-sized kernels, semihard in character. It differs from Preston chiefly in the somewhat softer kernels and the longer beaks on the outer chaff.

On the high plains of eastern Colorado and Wyoming this wheat has done fairly well. It has outyielded other wheats of the Preston group, but was not better than the Fife wheats.

Fretes.—The Fretes variety (C. I. No. 1596) was obtained in Algeria, but it is almost certainly a Russian wheat. It is very similar to Erivan, but the kernels are a little larger. It may be used as a winter wheat where the winters are mild; otherwise, as a spring wheat.

In the Judith Basin, in central Montana, Fretes has given good yields, as shown in figure 5. Its yield there has been better than that of any other common spring wheat.

MISCELLANEOUS WHEATS.

There are several varieties of common spring wheat in the northern Plains which do not belong to the Fife, bluestem, or Preston group. Most of them are grown only locally and are not really important. Most of them also are not of as good quality as the Fife and bluestem varieties, and the growing of them should not be encouraged.

Among these miscellaneous varieties are the Galgalos, Humpback, Huron, and Manchuria.

Galgalos.—The Galgalos variety (C. I. No. 2398) is beardless, with brown, hairy chaff and large, soft, white kernels. It came from the Erivan Government, in the Transcaucasus district of Russia, between

the Black and Caspian Seas. There it is grown as a dry-land spring wheat, and it has been so grown here.

It is a soft, white wheat, and as such is not desirable for growing in a hard red-wheat district. It has proved a high yielder in the Judith Basin of Montana, but for the reasons given it is not recommended. It is grown sparingly in the southern part of the Plains, in western Texas, and in western Oklahoma, but there winter wheats should always be grown if possible.

Humpback.—The Humpback variety (C. I. 3690) has bearded heads, white, hairy chaff, and a rather large, red, hard or semihard kernel. It first came to notice near Kensington, Minn., about 18 years ago. It has been called Bearded Bluestem because of the bearded heads and hairy chaff. It is now most commonly called Humpback because of the shape of the kernel.

This wheat is said to be grown now at several points in Minnesota and even in the Dakotas. There are no facts to show that it is a high yielder in the section covered by this bulletin. Where the writers have tested it, the yields have not been high. The milling quality apparently is not as good as that of the Fife and bluestem wheats. For these reasons it is not recommended.

Huron.—The Huron variety (C. I. No. 3315) is a selection from a hybrid between Ladoga and White Fife made some years ago in Canada. In appearance it differs from Preston chiefly in having light-brown chaff instead of white chaff. It perhaps is a little earlier than Preston, but it is not better in any other way. It is not recommended for growing under present conditions.

Manchuria.—The Manchuria variety (C. I. No. 2492) came from Manchuria, as the name indicates. It is an early-maturing bearded variety with hairless, reddish brown chaff and medium-sized, semihard red kernels. It has made a comparatively good yield at Newell, S. Dak., near the Black Hills. It has yielded better than the bluestem and Fife wheats, but not as well as durum or common winter wheats. Its advantage over other spring wheats at this point is due to its earliness. Its milling qualities are poor, and it should not be grown.

DURUM WHEAT.[1]

The acreage of durum wheat in the United States in 1909 is shown in figure 7. Many varieties of durum wheat have been imported into this country during recent years. Only the best known varieties are here described. All durum wheats are closely related, and many are similar in appearance. They differ from the other spring wheats in both plant and kernel. The plant is usually taller and more vigorous and has wider leaves than common wheat (fig. 2, *a*).

[1] For a more complete discussion of durum wheat, see Salmon, Cecil, and Clark, J. A., Durum Wheat. U. S. Dept. Agr., Farmers' Bulletin 534, 16 pp., 4 figs., 1913.

The heads are broader, more compact, and shorter, varying in length from 2 to 2½ and 3 inches (fig. 3, *e*). The peculiar flattening of the head has been described already (fig. 4, *A*1 and *B*1). The beards are longer than those of common wheat and vary with the variety and environment. The kernels are large and very hard, as indicated by the name "durum." The usual color of the grain is amber, a clear yellowish brown. There are wide variations between different varieties in the general appearance of the plant and head, and to some extent in the size, shape, and color of the kernel.

The principal varieties in cultivation in the United States may be assembled into groups as follows: (1) The Kubanka group, (2) the

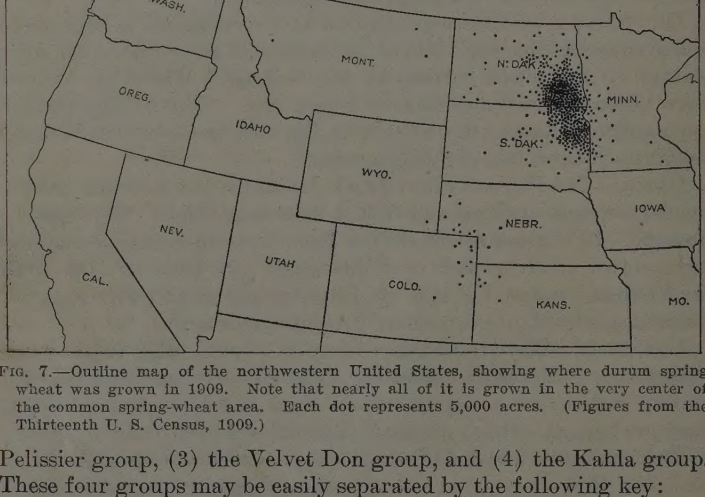

FIG. 7.—Outline map of the northwestern United States, showing where durum spring wheat was grown in 1909. Note that nearly all of it is grown in the very center of the common spring-wheat area. Each dot represents 5,000 acres. (Figures from the Thirteenth U. S. Census, 1909.)

Pelissier group, (3) the Velvet Don group, and (4) the Kahla group. These four groups may be easily separated by the following key:

Chaff yellowish:
  Chaff not hairy—
    Beards yellow ..... 1. KUBANKA.
    Beards black ..... 2. PELISSIER.
  Chaff hairy—
    Beards black ..... 3. VELVET DON
Chaff black:
  Chaff slightly hairy—
    Beards black ..... 4. KAHLA.

THE KUBANKA GROUP.

The varieties of this group are marked by yellowish, hairless chaff and yellow beards.

The following names have been used at various times and places for varieties of the Kubanka group: Arnautka, Beloturka, Ghar-

novka, Iumillo, Kubanka, Nicaragua, Pererodka, Taganrog, and Yellow Gharnovka.

Kubanka.—The Kubanka is the best known variety of durum wheat in this country. It was first introduced by the Department of Agriculture in 1900 from the Uralsk Territory in Russia, lying north of the Caspian Sea. That importation has been grown as Seed and Plant Introduction No. 5639, Cereal Investigations No. 1440, North Dakota No. 929, and South Dakota No. 75, but always under its real name, Kubanka. Other Cereal Investigations numbers given to lots of seed grown from this original lot are 2221, 2246, 2909, 2952, and 3009. A selection bred at Dickinson, N. Dak., and known as Kubanka No. 8, is Cereal Investigations No. 4063.

Several other importations of Kubanka wheat have been made, but none has proved as valuable as this one. These others are represented by Cereal Investigations numbers as follows: 518, 1220, 1258, 1349, 1354, 1424, 1490, 1516, 1581, 2094, 2234, 3303, and 3306.

The Kubanka has proved especially well adapted to the drier western portion of the northern Great Plains area. It has proved superior to other hard spring wheats in western North Dakota and in western South Dakota.

Arnautka.—Arnautka wheat is probably the most widely grown durum variety in this country. It is supposed to have been brought from Russia by early immigrants. The first importation of this variety was made by the United States Department of Agriculture in 1864. After being grown occasionally for a few years it was discontinued.

Its distribution by the Department of Agriculture dates from 1900, when seed was obtained from Mr. T. N. Oium, of Lisbon, N. Dak. (C. I. No. 1494, N. Dak. No. 778). A pure race (C. I. No. 4064) selected from this mass variety has proved a good yielder and is being distributed. Several importations were made in 1900 from Berdiansk, Russia, but these have not been widely distributed. A commercial lot of seed (C. I. No. 1493) called Wild Goose, obtained in 1901, has been distributed somewhat. Other Cereal Investigations numbers for these commercial and imported lots are 1429, 1430, 1431, 1547, 3080, 3693, and 4072.

The Arnautka variety is better suited than the Kubanka to the more humid parts of the northern Plains area. In the eastern parts of North Dakota and South Dakota, and in adjacent Minnesota, it outyields the Kubanka variety.

Beloturka, Gharnovka, and Pererodka.—The Beloturka, Gharnovka, and Pererodka varieties are all very similar to the Kubanka.

The Beloturka variety (C. I. No. 1513, N. Dak. No. 919, S. Dak. No. 72) came from the Paris Exposition, but undoubtedly is of Russian origin. The name, in Russian, means white Turk. It has

given high yields in the western part of the durum-growing section but is not better than Kubanka.

The Gharnovka variety was obtained in three lots from Taganrog, Don Cossacks Province, Russia. These lots were Gharnovka, C. I. Nos. 1443 (N. Dak. No. 915) and 1447 (N. Dak. No. 917), and Yellow Gharnovka, C. I. No. 1444 (N. Dak. No. 914). They have yielded slightly less than Kubanka and Arnautka in the Dakotas.

The Pererodka variety (C. I. No. 1350, N. Dak. No. 328) came from the Province of Orenburg, Russia. It probably was originally a Kubanka strain. It is a high yielder, but it has not been superior to or even quite as good as the Kubanka.

THE PELISSIER GROUP.

The three varieties so far recognized in the Pelissier group are Azizi (C. I. No. 2077), Medeah (C. I. No. 1597), and Pelissier (C. I. Nos. 1584 and 2086).

The only one grown in the northern Plains is Pelissier (C. I. No. 1584), which was developed by a man of that name in Oran, Algeria. It has been a high-yielding variety at some points in the western part of the spring-wheat section, but has not become generally cultivated.

THE VELVET DON GROUP.

Belonging in the Velvet Don group are Richi (C. I. No. 2089) and Velvet Don (C. I. Nos. 1445 (N. Dak. No. 930), 2222, and 2247).

This black-bearded variety with hairy chaff was introduced from the Don Cossacks Province of Russia by the United States Department of Agriculture in 1900. It has not proved as good a yielder as Kubanka and other varieties, and the flour yields are comparatively low. It is mentioned here only because it is occasionally found on farms in the section discussed.

THE KAHLA GROUP.

Only the Kahla (C. I. Nos. 1595 and 2088) and the Purple Durum (C. I. No. 3024) are placed in the Kahla group. The Kahla is a black-chaffed, black-bearded variety, commonly grown by the Arabs in Algeria. It is there considered one of the best varieties of durum wheat and is held to be adapted to a wide range of adverse conditions. It has been tested in this country, but not distributed to any extent and is only occasionally found on the farms.

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